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**LITHUANIA ON THE WAY TO ENERGY INDEPENDENCE:
AN EXPERIENCE OR A LESSON?**

The article considers the steps taken by Lithuania towards gaining energy independence in the interbellum and the Soviet periods. The author analyses the peculiarities of the republic's energy policy after achieving independence in the early 1990s and estimates the methods of diversifying energy supply in Lithuania.

Key words: economy, energy, thermal power plants, hydropower plants, nuclear power plants, intensification, isolated energy system, diversification, exploitation, independence, republic, Baltic Sea States, construction.

Lithuania appeared on the political map of Europe as an independent state after the termination of WWI. It was an economically underdeveloped country. The leading industry of Lithuania was agriculture; however, the country fell behind its neighbours in agricultural productivity [21, p. 460]. The manufacturing industry was developing very slowly. In the 1920s-1930s, the means of production in Lithuania, especially in agriculture, was almost at the pre-war level. Large industrial facilities dating back to the tsarist Russia were restructured, though their production did not generate demand. The engineering industry almost ceased to develop. Some progress was reported in the industries, typical of small agricultural countries: the food processing, the textile and knitting industries, and rubber processing [7, p. 8—11].

Low performance standards of most of Lithuanian industrial facilities and predominantly manual agriculture (simple mechanical aids were used only at bigger farms) did not require large-scale electricity production. In particular, total power demand of Lithuanian agriculture was only 20-30 horsepower [1, p.52].

In 1913, the total power generation in Lithuania amounted to 5.7 mln kW·h, and in 1940 – 81 million kWh. It is apparently a significant (14.2 times) increase. However, the corresponding indicators of the neighbouring countries are markedly different: in Latvia power generation increased 17 times, in Estonia – 34.5 times, and in the Belarusian SSR – 169 times. The per capita power generation (per capita indicator was popular in the socialist economy) amounted to 28 kW·h in Lithuania, 133 kW·h in Latvia, and 180 kW·h in Estonia [16, c. 9, 17; 22, p. 9].

The development of the energy industry in the republic was based on the construction and operation of thermal power plants. Smooth and flat landscapes of Lithuania did not encourage the construction of hydropower plants. Hydroelectric power resources remained almost untapped in the interbellum (in 1940, the hydropower generation amounted to only 2.5% of the total power generation [16, p. 17]).

At the same time, Lithuania had considerable peat reserves, which made the prospects of thermal power development quite feasible. However, the local fossil fuels were hardly ever exploited. In 1938-1940, annual extraction

of raw peat amounted to 120-130 tons or 0.1% of the proven raw peat reserves. Peat accounted for only 8% in the fuel balance of the republic, including power generation. The existing thermal power plants were fuelled by imported black coal and diesel oil (for example, approximately 300 tons of black coal were supplied annually from abroad) [8, p. 3].

Having chosen the strategy of thermal energy development, Lithuania consistently implemented it. So, the construction of the Petrašiūnai Power Plant started in the environs of Kaunas in 1926, the Bačiūnai Power Plant was built in the environs of Šiauliai, the Rėkyvos (came online under the Soviet rule) and other regional power plants were under construction. In 1940, 67 power plants operated in the Lithuanian republic with a total capacity of 38,000-39 MW·h [15, l. 90, 91; 11, l. 3].

Since Lithuania did not have opportunities to independently construct and operate power plants, it granted construction concessions to international, predominantly Belgian, entrepreneurs. Being monopolists, the Belgians set high electricity prices, which caused social unrest. Power shortage and high sale prices for electricity created the situation when the population of electrified areas preferred oil lamps to electric bulbs [23, p. 42—44].

The transition of Lithuanian economy 'onto social rails', dramatic intensification of the republic's development required the revision of its energy policy. The economic and sociocultural development of Lithuania should have taken place with a massive support from the USSR. The leaders of the republic were taking that into account and, of course, were agreeable to the employment of knowingly inefficient facilities. Therefore, an increase in energy generation was planned to result from the development of the hydro-power industry. According to Lithuanian specialists, the construction of several hydroelectric power plants even on the lowland rivers could have generated enough power for the implementation of the grand designs of the socialist leadership of the republic. So, the annual increase in electricity consumption before 1939 was 15%. The 1941 production plan expected a 24% increase only in the manufacturing industry. In 1941, the funds allocated for these goals increased elevenfold compared to the level of 1939.

The largest of the planned hydroelectric plants was to be built on the basis of the power plant in Turniškės, near Vilnius. Its designed capacity was 14 MWh (the thermal power plant that operated in Vilnius before the war met energy demands at the peak capacity up to 5 MWh), the plant was expected to be built in 1943, which would provide for the city's development. Moreover, the 1941 plan stipulated preliminary works on the construction of a hydroelectric plant in the environs of Jonava (construction completion in 1945-1946), which would significantly ease the energy situation in Kaunas.

The hydroelectric complex on the river Neris was supposed to incorporate the Kleboniškis power plant in 1946-1947. The 1941 plan also stipulated research on the use of the river Minija potential to provide the cities of Telšiai, Kretinga, Palanga and the port of Šventoji with electricity. The acute power shortage in Samogitia on the river Minija was supposed to be overcome by the construction of a 2 MW hydroelectric plant [6, p. 87—88].

WW II interrupted the implementation of the Lithuanian "GOELRO plan". Moreover, the republic was severely affected by the war – its energy industry lost a capacity of 32 MW. Only the losses of the Kaunas Power plant amounted to 32 mln roubles. The power plants in a number of Lithuanian cities were completely destroyed. Only 14 taken out of operation plants with a total capacity of 3,5000 kW required insignificant repairs before being brought back online [4, l. 29; 15, l. 90, 91; 19, l. 24; 20, l. 1—2].

The restoration of the republic's generating capacity became a priority not only for Lithuania: on April 13, 1945 the State Defence Committee (SDC) considered urgent measures to rebuild power plants and transmission lines in the Lithuanian SSR. Literally the whole country was aiding Lithuania: Leningrad supplied generators, Moscow contributed transformers, Ural and Ukraine provided the republic with boilers, rolled sections, and electric wires. The most significant support was offered by power engineering specialists. Four EMUs with a 6,500 KW capacity arrived in the republic [15, l. 92; 22, p. 93].

Alongside solving the urgent problems related to meeting the republic's electricity demand, Lithuanian power engineers thought about the future of the energy industry. The restoration of the destroyed power plants was underway, but the energy policy of the republic was supposed to be formulated in view of the future development of Lithuania.

Before the war, the republic charted a course of energy development based on the construction of hydroelectric plants. This course remained unchanged after the war. Lithuanian leaders managed to convince Moscow of the need for its implementation. Moscow granted support to the republic's authorities.

According to the SDC decree of 13 April 1945, an environmental survey concerning the construction of Phase 1 hydroelectric plant was supposed to take place on the river Neris. The Ministry for Power Plants of the USSR commissioned the Moscow branch of the Hydroenergoprojekt trust to do feasibility studies. Three perspective building sites were to be considered: Turniškės, Jonava, and Kaunas. A part of the preparatory work had been conducted before the war. Vilnius attempted on site investigation as early as 1944-1945. However, the analyses showed that the data collected for these purposes were 'raw' and did not give sufficient grounds for the location of the power plant. Hydroenergoprojekt decided to create in Vilnius an integrated survey group, which would include a small Litenergo survey department, and proceeded to business. Simultaneously, Litenergo submitted to Hydroenergoprojekt a request for site investigation for the construction of a new hydroelectric plant in Vilnius [3, l. 61].

Lithuanian public did not absent themselves from the problem. In autumn 1945, power engineers of Kaunas State University (the initiative group was headed by assistant professor Stonys) addressed the Central Committee of the Lithuanian Communist Party with a proposal to build a hydroelectric complex on the river Neman. They wrote that "between the villages of Nemajūnai and Birštonas, the river Neman forms a loop with a 40 m difference in the water level. It is possible to build at least two 100-120 MW hydroelec-

tric plants there; the cost of the main facility construction amounts to 250-300 mln roubles". Moreover, the construction of dams on the Neman would extend its navigable part and provide, through a system of canals, access to the rivers Pripyat and Dnieper as well as to the Black Sea [18, l. 17—18].

The construction of hydroelectric plants was the most worthy undertaking for Lithuania; however, the process of their construction was time demanding (3-5 years), moreover, it required significant investment, which could be provided only by the Centre. In the post-war period, one could hardly expect regular financing. A way out was to build thermal power plants, which required 1-2 years to come online.

The strategy for the republic's energy industry development was finally formulated; it stated that "it is necessary to start the construction of a hydroelectric plant, but due to the increasing electricity demand in the manufacturing industry, until hydroelectric plants are set in operation, it is reasonable to construct simultaneously, in the areas rich in peat, auxiliary thermal power plants, which will later be placed in cold reserve or be used as backup power sources" [15, l. 91].

Here emerged a surprising, at first glance, problem that, on a large scale, was discernible even in the pre-war period. It was related to the fuel supply to the thermal plants. The shortage of solid and liquid fuel supply to Lithuania from other Soviet republics became obvious as early as 1945.

There arose a problem of the provision of the thermal plants with local fuel, i.e. peat. In view of significant peat reserves, it seemed that Lithuania could have easily solved this problem. But it did not happen. Both in the pre-war period and in the first post-war years, the volumes of local fuel extraction were not sufficient. Lithuanian leaders tried to find a rational explanation for the failure. In particular, one of the communications to the Centre stated that "the provision of local fuel was extremely problematic, since the existing machinery could not be used in the extraction process due to the shortage in fuel", and the shortage in coal "extremely negatively affected the implementation of the programmes in a number of principal manufacturing industries, namely: the textile, knitting, footwear, rubber processing and metalworking industries (including the production of agricultural equipment and spare parts), since only 36% of the power generation programme have been implemented so far" [14, l. 154].

But the analysis of data on the annual peat extraction shows that the low rate of peat extraction (14.4 %) was related to the inefficient management and control over the plant operation by the leaders of the republic [7, p. 29—30].

In 1946, Vilnius started to devise a perspective plan for the development of the economy of the Lithuanian USSR for 1946-1965. The energy industry was also included in this plan.

The leaders of the republic stood for the establishment and development of an isolated energy system in the Lithuanian USSR. The strategy stipulated the construction of small, sometimes unprofitable thermal and hydroelectric plants fuelled by local energy resources and imported solid and liquid fuel.

Lithuania had limited local energy resources - only hydro power and peat. The area of the proven peat deposits amounted to 125,700 ha; the peat reserves were estimated at 187 mln tons of coal equivalent. Experts assessed these reserves as sufficient only for a short-term perspective. Thus, the plan maintained the idea of predominant usage of hydro power. But due to the peculiarities of the hydroelectric plant construction (relatively long construction period), the first stage was supposed to focus on the intensive development of thermal energy, if possible, accompanied by the usage of peat as a fuel, though, in effect, coal did prevail. Later, thermal plants were to be used in addition to hydroelectric ones in low-flow periods. Peat reserves were meant to be used for heat production meeting the demands of industry and the population [10, l. 4].

As to hydropower, its designed capacity amounted to approximately 500 MW, while the Neman accounted for 280 MW, the Neris – for 100 MW, the Šventoji – for 20 MW and the other smaller rivers – for 100 MW. As the plan was devised, the use of hydro resources in the republic amounted for only 1% of their maximum capacity [10, l. 5].

The territory of Lithuania was divided into four regions: the Vilnius, Kaunas, Šiauliai, and Klaipeda areas. The Kaunas and Vilnius systems were based on hydroelectric power, the Šiauliai system – on peat, and the Klaipeda system – on coal and peat. The Kaunas system was expected to be the most efficient and to cover a significant part of the republic's territory with its transmission network. Firstly, the centre of attention was the construction of the Kaunas hydro system, and the construction of hydroelectric plants on the other rivers was in the offing. One of the most significant measures to be taken was the establishment of the integrated republic's 110 kW energy supply system [10, l. 7-8].

In general, the perspective plan of the republic's energy development was being implemented during most of the specified period. But there were certain adjustments. In particular, the launch of hydroelectric plants was delayed while the number of thermal plants set in operation increased; 10 thermal and 2 hydroelectric plants came online in the Lithuanian SSR in the 1950s. A significant achievement of the republic's energy industry was the commenced combined generation of electricity and heat. In that period, there were 1240 power plants with a total capacity of 188,200 kW in Lithuania. In 1955, the construction of the 90 MW Kaunas hydroelectric plant eventually started. In the first post-war years, this energy facility was literally built by the whole USSR. Gorky, Minsk, Narva, Kostroma, Kuibyshev, Svir, etc. supplied materials and equipment; skilled hydro engineers came to Lithuania from throughout the USSR [5, p. 114—115].

In 1960, the Kaunas Hydroelectric Plant was built. But this success turned out to be the last one for the advocates of the predominant development of hydroelectric power in the republic. The rapid production growth, the planned widespread electrification of the agricultural industry required a dramatic increase in power generation. In 1958, the power generation in Lithuania was four times less than the USSR average [8, p. 11]. The Kaunas power plant did not equalise the rates of the energy industry development.

On the contrary, it became obvious that the construction of hydroelectric plants is a dead end. Due to the lowland terrain, hydroelectric plants were unprofitable and of a low capacity. The course towards the creation of an independent isolated republic's energy system proved to be unfeasible.

In early 1960s, the USSR launched a large scale construction of thermal power plants. In the Lithuanian SSR, the development of hydroelectric plants was suspended in favour of the construction of a 1200 MW state district power plant (SDPP) in Elektrėnai. The solution of Lithuania electricity supply problem was resolutely approached by the Centre. The supply of natural gas and liquid fuel instead of blackcoal was ensured for the construction of the SDPP in Elektrėnai. As early as in 1961, the republic started to receive gas from the Minsk – Riga – Dashava – Vilnius pipeline. In 1965, 1200 mln cubic meters of gas were supplied to Lithuania. In the mid-1960s, natural gas accounted for 1/3 in the fuel balance of the Lithuanian SSR. And its share was increasing [8, p. 12].

The republic entered a new stage of energy development marked not only by the construction of a large power plant but also by the establishment of an integrated energy system of the North-West of the USSR. This system include the Leningrad, Karelian, Estonian, Latvian, Lithuanian, Belarusian, and Kaliningrad energy systems and ensured stable energy supply to consumers over several decades [22, p. 101].

At the same time, the leaders of the USSR arrived at the decision to build NPPs in the environs of Leningrad and in the Vitebsk region of the Belarus USSR to satisfy the needs of the North West of the country. But the soils in this region of Belarus did not meet safety requirements, thus, the construction was moved to the neighbouring Lithuania, close to the Belarusian border. Lithuanians tried to refuse this 'gift' and this hostile attitude to nuclear power production remained until the early 1990s, when the republic gained independence, but the interests of the Union, which was devising construction plans for all Soviet Baltic Republics were difficult to oppose. The administrative borders were of little significance for such projects [3].

Initially, it was planned to build four 1.5 GW RBMK units. The construction started in 1974, Unit 1 came online in 1983, Unit 2 was ready by 1986, but because of the Chernobyl disaster it was put in operation only in 1987. Experts assessed the availability of Unit 3 as 60%. But a wave of protests that surged through the Baltic republics led to a suspension of the construction (the mottos like "We don't need an NPP, we are ready to light oil lamps" reminded of the 1930s protests sparked by the Belgian energy monopoly in Lithuania). As a result, after the demise of the USSR, the unwanted 'gift' meant for the Baltic Republics and certain regions of the Russian Federation and Belarus became, absolutely for free, the sole property of Lithuania.

Alongside the construction of the NPP, Lithuania was developing the republic's energy supply system. By the moment when Lithuania gained independence, it had a developed power generation industry, which it managed to maintain and, to a great extent, upgrade. It is important to mention that the energy system of Lithuania is diversified in terms of power plant types,

which is a certain advantage. Today Lithuanian generating facilities consist of eight large power plants – the Lithuanian Power Plant in Elektrėnai (1800 MW), the Vilnius (384 MW), the Mažeikiai (194 MW), the Kaunas (178 MW), the Industrial (51 MW), the Klaipėda (11 MW) Power Plants, the Kruonis Pumped Storage Plant (880 MW), and the Kaunas Hydroelectric Power Plant (101 MW) [2].

But these power plants generate only one fourth of Lithuanian electricity demand. The remaining three fourths have to be imported. Moreover, all thermal plants are fuelled by gas, 100% of which is supplied from Russia.

Over the whole period of Lithuanian independence, these concerns have been in the centre of attention of Lithuanian leaders. It is obvious that the energy policy of Lithuania that was being elaborated at that time had to deal with these issues. Energy independence was to be pursued to meet certain political interests, defined as "energy independence from Russia".

Since Lithuanian accession to the EU, several projects to achieve such independence have been discussed: the construction of a local Lithuanian or cooperative (the Baltics + Poland) NPP, the building of an offshore cable from Sweden or a power bridge from Poland, raising efficiency of local power plants and, finally, there were some hopes for electricity supply from Ukraine.

An optimistic statement was made by the president of Lithuania Dalia Grybauskaitė at the end of 2009: "as the old Ignalina NPP is closed, the year 2010 will become the beginning of energy independence). According to the head of state, Lithuania will finally have the opportunity to diversify energy sources through cooperation with Western and Northern European states [9]. Experts reasonably say that real diversification can be discussed only in terms of the above mentioned projects but they cannot be implemented earlier than in 4-5 years, after the construction of the networks is started. In the nearest future, Lithuanian Exchange will offer only Russian energy. And there are no strong motives that would make Russia voluntarily leave this market.

As to the supply of Ukrainian electricity to this market, on the one hand, it is still at the stage of discussions and there is a lack of reliable data; on the other hand, one should take into account that the transit route will go across the territory of Belarus. It can evidently, in view of the peculiarities of electricity supply to the Kaliningrad region, question the reliability of this project. The price of Ukrainian electricity can just appear non-competitive in Lithuanian market.

On December 31, 2009, Lithuania closed the Ignalina NPP, which played the leading role in the elaboration and implementation of the energy policy of the country. Twenty five years ago, due to the dictate of the USSR, Lithuanians gained if not energy independence but a good opportunity to ensure their development in favourable, from the energy supply perspective, conditions. At the end of 2009, again, due to a dictate, but this time of another Union, Lithuania was left without a certain energy policy.

A year ago, the chair of The Board of National Investor Leo LT (the company that was closed at the request of President D.Grybauskaitė) Gintau-

tas Mažeika had to admit, "Whether we like it or not, Russia is still our main energy source" [12]. Energy independence with no regard to such pragmatic circumstance will be a rather difficult undertaking.

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